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CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

CD NO.

COUNTRY USSR

SUBJECT Economic; Technological - Machine tools

DATE OF INFORMATION 1952

HOW PUBLISHED Monthly periodical

DATE DIST. 30 Apr 1954

WHERE PUBLISHED Moscow

NO. OF PAGES 4

DATE PUBLISHED Jun, Jul 1952

LANGUAGE Russian

SUPPLEMENT TO REPORT NO.

THIS IS UNEVALUATED INFORMATION

SOURCE Stanki i Instrument, No 6 and 7

NEW DEVELOPMENTS IN SOVIET MACHINE-TOOL BUILDING

Ye. G. Alekseyev

[Numbers in parentheses refer to appended sources.]

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Sixty-six metal-cutting machines were exhibited at a machine-tool exposition recently held in the USSR. Of these, 10 percent were completely automatic, 15 percent were semiautomatic, and 10 percent were partially automatized. These machine tools are universal, general-purpose machine tools. In capitalist countries, the proportion of automatized machine tools does not exceed 2-3 percent of the machine-tool park.

Machine tools with various types of drives and other special design features were demonstrated.

The Elir, an electroionic (elektroionnyy) speed regulator which is beginning to find application in low-power machine tools, converts alternating current into direct current and regulates the speed of a direct-current electric motor.

The 1P61 lathe which is equipped with the Elir spindle drive with a rated capacity of 4.5 kilowatts has shown exceptional flexibility in control and notable ease in operation. However, this type of drive, rated at more than 1-3 kilowatts, cannot yet find wide application in industry because of difficulties caused by an inadequate selection of thyratrons and because of the high cost of production. This high cost is due to the need for a special transformer rated at the full power of the drive and to the considerably greater cost of direct-current machines.

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Model AT-4, a basic type of lathe, was exhibited by the Moscow Krasnyy Proletariy Plant. A mechanism in this machine tool makes it possible, by means of jigs, to automatize the machining process of simple parts such as step shafts. This drive has a system of path control in which the decimal system of multiplication is used The controls for the stops are kinematically connected with the longitudinal or cross tool travel. Path control is accomplished by turning a series of disks which carry an electrical-contact device with numbered designations corresponding to tenth of a millimeter.

The Model 1622 screw-cutting lathe demonstrated at the exposition can cut lead screws up to 2.5 meters long with an accumulated error of not more than 5-10 microns per meter. Such accuracy has been achieved by high standards of manufacture, simplicity of design, strict calculation of possible deformation of the part or machine tool, and incorporation of a correcting device which compensates for unavoidable errors in manufacture, errors of temperature, or errors caused by other factors.

The correcting device is a mechanism which automatically turns the master nut of the tool slide in accordance with the profile of the template located along the machine-tool bed. [See 00-W-24417 for specifications of Model 1622]

The Model 6P12 vertical milling machine is an ordinary universal machine tool which can perform all types of milling operations. It is equipped with a tracing drive and control system which makes it possible to automatize the manufacture of irregularly shaped cams, dies, etc.

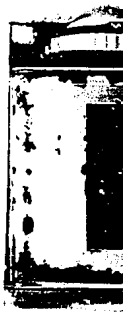
The Odessa Milling-Machine Plant exhibited the Model OF-8, a small vertical hydraulic tracer milling machine. It can machine parts to satisfactory tolerances at feeds up to 300-400 millimeters per minute. This rate has been made possible by the special design of a hydrofeeler in which the sensitivity of the system has been greatly increased by creating artificial vibration of the valve. The use of hydraulic cylinders for table travel has made it possible to develop an unusually simple machine tool.

The Model 6441 special tracer milling machine produced by the Leningrad Plant imeni Sverdlov is equipped with electric feelers of the inductive type. This system automatizes the process of machining very complex profiles.

A very important task of machine-tool builders is to provide against occupational hazards. In operating high-speed machine tools, flying chips sometimes injure the workers. Various types of guards do not always prevent accidents.

In a new arrangement of the multitool Model 1731 lathe, the tool slides have been placed behind the spindle. Such an arrangement improves the conditions for loading the machine tool, assures an even flow of chips, and provides a convenient mounting for a movable guard to shield the working area of the machine tool.

Soviet prewar machine-tool building had made considerable advances in building groups of interchangeable and unified machine tools such as a group of turret lathes. At present, the work on unification is being conducted on a new basis. A typical solution to the problem of unification is found in heavy vertical boring and turning mills, one of which was displayed at the exposition. These machine tools, which are built in various sizes, have identical feed and gear boxes and a single type of mechanism for lifting and fastening the crossrail. The common character of this type of machanism makes it possible to build machine tools for light, normal, or heavy operation, depending on the consumer's needs.



The use of unified speed and feed boxes, calculated for transmitting power for the largest machine tool in a group, is practical even if these units are not used to full capacity on small machine tools. The units do not significantly increase the weight of a machine tool; they comprise only 8-10 percent of the total weight of a vertical boring and turning mill. The use of such units does not create any difficulties in machine-tool operation because of the full mechanization of gear shifting and slide travel. The advantage of producing a unified design compensates for the small overconsumption of metal. The GZFS (Gor'kiy Milling-Machine Plant) knee-type milling machines are examples of unification. Two machine tools of approximately the same dimensions have common units for the feed and speed control mechanisms.

The Model 3153 cylindrical grinding machine, produced by the [Leningrad] Plant imeni Il'ich, is an example of unified machine tools of the universal, in-feed, high-precision-magazine-automatic type.

Model 16K lathe, though similar in many ways to Model 1620, is heavier and has a speed box with step-type speed adjustment.

Model 1B62 universal screw-cutting lathe now has a spindle speed of 1,500 rpm as compared with 600 before modernization. Its weight was increased only 10 percent but its power was doubled. It can now operate at speeds of 300-500 meters per minute and cut chips of a cross section formerly possible only when rough cutting at a speed of 30-40 meters per minute.(1)

The vertical boring and turning mill produced by the [Krasnodar Machine Tool] Plant imeni Sedin has been provided with remote slide control from a suspended control panel. This has been achieved by using an individual motor for rapid travel of each slide and the use of electromagnets to shift the clutches for selecting the type of slide travel desired.

Among a group of gear-processing machines is the Model 5832 gear-grinding machine. This model has a large grinding wheel with a worm profile, assures the production of small-module gears with better than first-class accuracy, and can machine gears from a solid, hardened blank. The wheel is dressed by a simple roller at lowered grinding-wheel speeds.(2)

SOURCES

1. Moscow, Stanki i Instrument, No 6, 1952

2. Ibid., No 7, 1952

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